Kingston Technology KTM-16AT Memory Expansion for 286 and 386SX Personal Computers

KTM-16AT
Memory Expansion Board for 286 and 386SX Personal Computers

Kingston Technology Corporation
17600 Newhope Street
Fountain Valley, CA 92708-9885

Phone (714) 435-2600 Fax (714) 435-2699

Limited Warranty

KINGSTON TECHNOLOGY CORPORATION (hereinafter called KTC) warrants that this product is free from defective material and workmanship and, subject to the conditions set forth below, agrees to repair or replace any part of this product which proves defective by reason of improper workmanship or materials for a period of five years from the date of original retail purchase, without charge for parts and labor.

If this product does not perform as warranted herein, owners sole remedy shall be repair or replacement as provided below. In no event will KTC be liable for damages, lost revenue, lost wages, lost savings or any other incidental or consequential damages arising from purchase, use, or inability to use this product, even if KTC has been advised of the possibility of such damages.

Any defective product should be returned to your **local dealer** or **distributor,** along with a copy of your sales slip, product serial number and a detailed description of the problem you are experiencing.

No express or implied warranty is made for any KTC product damaged by accidents, abuse, misuse, natural or personal disaster or unauthorized modification.

©Copyright Kingston Technology Corporation 1991. All rights reserved. Printed in the U.S.A.

IBM® is a registered trademark of International Business Machines Corporation.

TABLE OF CONTENTS

Welcome!....1

Section 1 - General Description....2

Section 2 - Package Contents....3

Precautions....3

Section 3 - Before You Begin....4

Section 4 - Switch Settings....6

Section 5 - Install the SIMM Modules....8

Section 6 - Install the KTM-16AT Board in Your PC....10

Section 7 - The Configuration Setup Program....11

Section 8 - Modifying CONFIG.SYS....13

Installing the Driver....13

Expanded Memory Driver (EMS)....13

Testing the Kingston EMM Driver....14

Using EMS 4.0....14

Command Line Options....14

Appendix A - Extended vs. Expanded Memory....16

Some History....16

Extended (Linear) Memory....16

Expanded (Paged) Memory....16

Appendix B - Troubleshooting.....18

Error Messages.....18

List of Figures

Figure 1: The KTM-16AT Memory Expansion Board.....2

Figure 2: Switch Settings on the KTM-16AT Memory Expansion Board.....6

Figure 3: Installing the SIMM Modules.....8

Figure 4: Expanded and Extended Memory Configuration.....9

Welcome!

Kingston Technology welcomes you to the growing family of personal computer users who have chosen Kingston Memory Expansion options for their computers. As application programs expand in size and complexity, the need for efficient and reliable memory expansion becomes critical. Our aim is to provide you with high quality memory expansion products that give maximum performance benefits at an affordable cost. We have engineered our memory products to be durable, reliable, and trouble-free; and we are confident that you will receive optimum performance from this Kingston product for many years to come.

The information in this booklet will guide you through the process of placing the memory modules on the circuit board, installing the circuit board inside your computer, and configuring the necessary software to recognize the new memory. Please take a few moments to read through this manual now and familiarize yourself with the procedures you will need to follow when you install the Kingston board and software.

We have tried to anticipate many of the problems that may arise during the installation, and most of your questions will be answered by reading this book. However, if you encounter a situation that you can't resolve, or have any questions regarding the installation or use of the equipment, please call the Kingston Technical Support Center in Fountain Valley, CA.

Section 1 - General Description

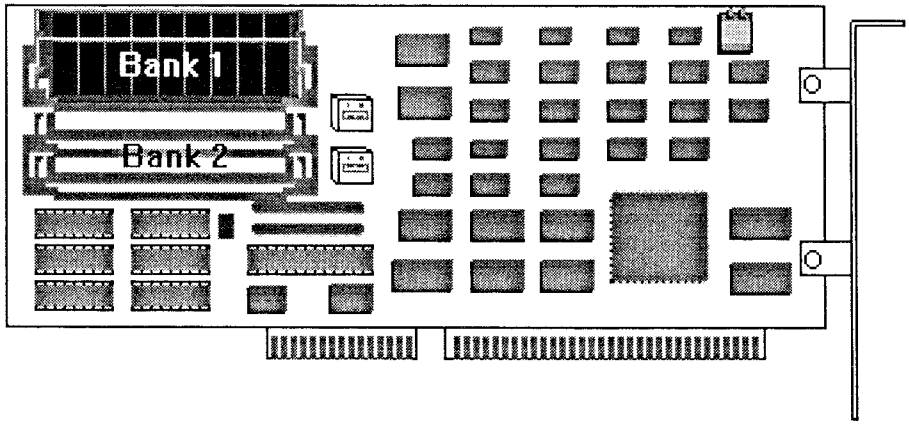
The Kingston Technology KTM-16AT Memory Expansion Board is capable of adding up to 16MB of Random Access Memory (RAM) to 286 and 386SX personal computer systems. Two or four Single Inline Memory Modules (SIMMs) can be plugged into the sockets on each KTM-16AT board. The SIMMs must be installed in pairs. The KTM-16AT board can be installed in any 16-bit expansion slot in the 286 or 386SX computer system.

The KTM-16AT supports:

- Memory backfill if your system has less that 640K (16-bit).
- EXTENDED (linear) memory up to 16MB (16-bit).
- EXPANDED (paged) memory (EMS 4.0) up to 16MB (8-bit).

The KTM-16AT requires either:

- Two 1MB SIMMs (KTM-1000/9-80S)
  or
- Two 4MB SIMMs (KTM-4000/9-80S)



Section 2 - Package Contents

In addition to this manual, you should also receive the following items:

- One KTM-16AT Memory Expansion Board
- Two 1MB Single Inline Memory Modules (SIMMs)
  (KTM1000/9-80S)
- One Kingston Option Diskette

Be sure the items you receive are genuine Kingston Technology products. The printed circuit board has the Kingston name etched on its surface. If the Kingston name is missing, it's not a genuine Kingston product.

If any item is missing or damaged, contact the Kingston dealer or distributor from whom you purchased the upgrade.

Precautions

Kingston memory boards are shipped in an anti-static plastic bag inside a cushioned box which protect them from shock and static electricity that could cause severe damage to the memory chips.

Before you remove any memory component from its packaging, be sure you discharge any static electricity by touching a securely grounded metal object.

Also, keep magnetized tools, such as magnetic screwdrivers, away from the board and memory modules.

Section 3 - Before You Begin

Read through this manual before you begin installing the KTM-16AT board, so you'll know what to expect as you go along. Although this is a relatively easy installation, you may feel more comfortable asking your local Kingston dealer or computer service center to do it for you. There will undoubtedly be a fee associated with doing this, but your peace of mind may be worth the cost.

Pay special attention to Appendix A, "Extended vs. Expanded Memory." If your computer uses DOS, you will have to decide how much of your added Kingston memory to allocate as extended (linear) memory, and how much to allocate as expanded (paged) memory. If your computer uses OS/2, all added memory should be allocated as extended since OS/2 can address all added memory directly.

Allow plenty of time for the installation and configuration process. It should take only half an hour or so, but if you rush yourself, errors and set-backs are more likely to occur. We want this process to go smoothly for you, so have patience and use caution.

Installation Overview

Here is a quick look at the steps you will need to take to install the KTM-16AT board and configure your PC to use it.

- ❑ Check the contents of the KTM-16AT package.
- ❑ Set the switches on the KTM-16AT board.
- ❑ Install the SIMMs on the KTM-16AT board.
- ❑ Install the KTM-16AT board in your PC.
- ❑ Configure and allocate memory using the Kingston Option Diskette.
  - ❑ If your operating system is OS/2, or if all new memory was allocated as **extended**, you're finished. STOP HERE.
  - ❑ If all or part of new memory was allocated as **expanded**, install the Kingston EMM driver and modify the CONFIG.SYS file. Now you're finished. STOP HERE.

Section 4 - Switch Settings

The KTM-16AT Memory Expansion Board is shipped to you with 2MB of memory There are three sets of switches on the KTM-16AT board, labeled SW1, SW2, and SW3.

If this is the first memory expansion board being added to your computer, and if your computer has 1MB or less of main system memory, then you do not need to change any switch settings on the KTM-16AT board.

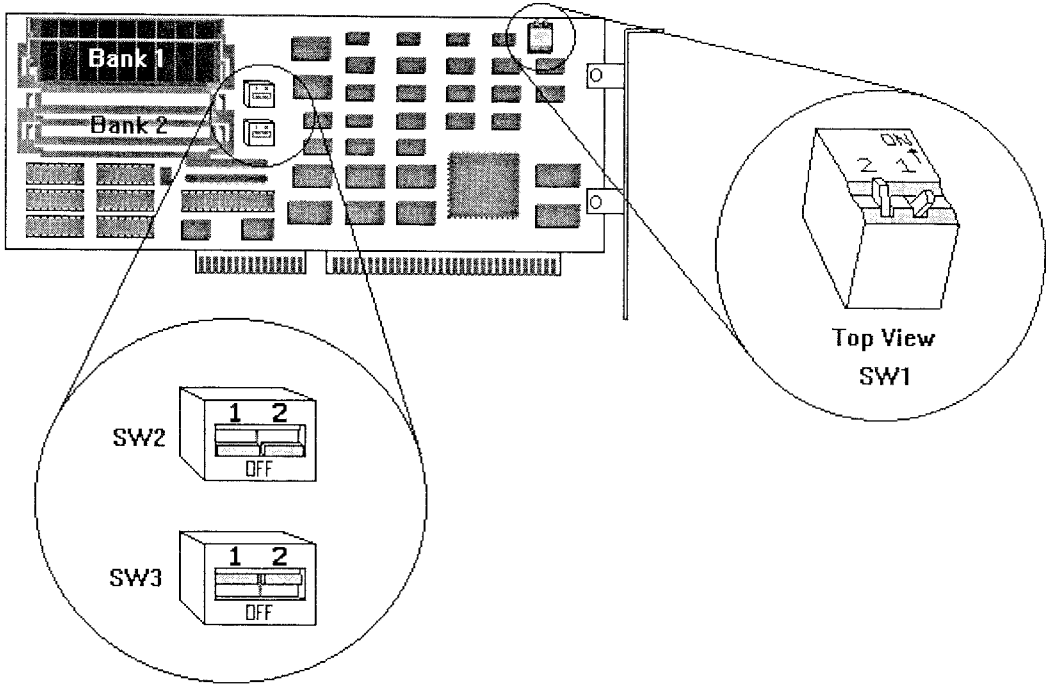


Figure 2: Switch Settings on the KTM-16AT Memory Expansion Board

SW1 has two switches. Switch 1 on SW1 enables and disables all the memory on the board, while switch 2 identifies this board as the first or second memory expansion board in your computer. Set switch 1 to the **OFF** position to enable memory, and set switch 2 to the **ON** position if this is the first memory board in your computer. Set switch 2 to the **OFF** position if this is the second memory board in your computer.

NOTE: The default switch settings are shown in **bold** type in the examples below.

SW1 Settings

Switch 1		Switch 2	
ON	– Memory Disabled	**ON**	– Board No. 1 (Standard setting)
OFF	– Memory Enabled (standard setting)	OFF	– Board No. 2

The other two set of switches, SW2 and SW3, identify the amount of memory installed in each of the two memory banks. (See Figure 2 for the location of the memory banks on the KTM-16AT board.)

SW2 identifies the amount of memory in Bank 1. Make sure the two switches on SW2 are set appropriately for the amount of memory you are going to install on the board:

SW2 Settings - BANK 1

Switch 1	Switch 2	
ON	ON	No SIMMs installed in Bank 1 (See Note below.)
OFF	**ON**	2MB (Two 1MB SIMMs) - Standard setting
OFF	OFF	8MB (Two 4MB SIMMs)

NOTE: Bank 1 must be filled before you install any SIMMs in Bank2.

SW3 identifies the amount of memory in Bank 2. Make sure the two switches on SW2 are set appropriately for the amount of memory you are going to install on the board. If you are not going to install any SIMMs in Bank 2, leave the two switches in ON position.

SW3 Settings - BANK 2

Switch 1	Switch 2	
ON	**ON**	No SIMMs installed in Bank 2 (Standard setting)
OFF	ON	2MB (Two 1MB SIMMs)
OFF	OFF	8MB (Two 4MB SIMMs)

When the switches are set correctly, you're ready to install the SIMMs as described in the next section.

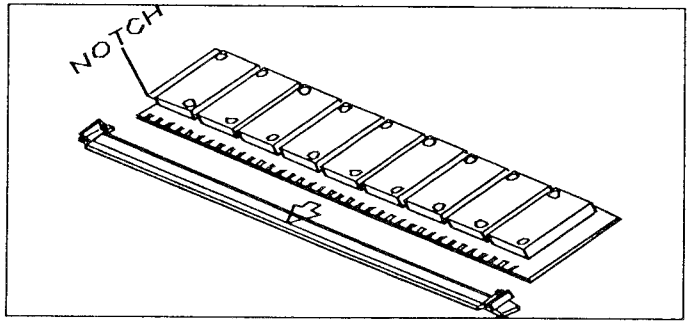
Section 5 - Install the SIMM Modules

If the SIMMs are already installed on the KTM-16AT board when you receive it, and you do not plan to add or remove any SIMMs, you can SKIP THIS SECTION, and go directly to Section 6, "Install the KTM-16AT Board in Your PC."

The KTM-16AT board has four sockets labeled P1, P2, P3, and P4 into which you can plug either two or four SIMMs. The SIMMs are available in two different memory capacities: 1MB (KTM1000/9-80S) and 4MB (KTM4000/9-80S)

NOTE: The SIMMS must be added in matched pairs, either two 1MB SIMMs or two 4MB SIMMS at a time.

1. Install the highest capacity SIMMs in sockets P1 and P2 on your KTM-16AT board. Notice that the SIMM plugs into the socket at an angle as shown in Figure 3.



2. Carefully push the SIMM into the socket until it is firmly seated. Then push the SIMM gently toward the memory board until the tabs shown in Figure 4 snap over each end of the module.

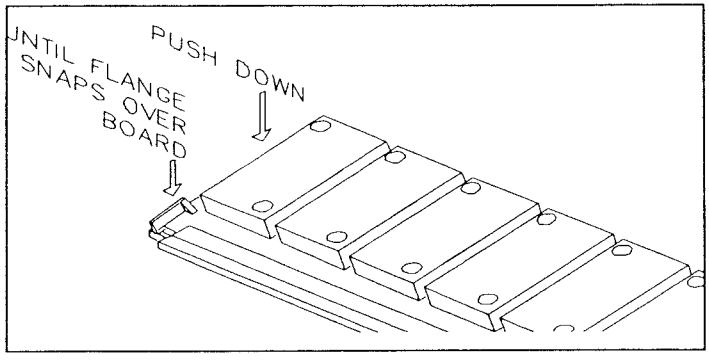


Figure 4: Installing the SIMM Modules

3. If you have another pair of SIMMs to install, plug the next highest capacity SIMMs in sockets P3 and P4 on the KTM-16AT board. Use the same technique you used to install the first pair.

Section 6 - Install the KTM-16AT Board

Now you're ready to install the KTM-16AT Memory Expansion Board inside your PC. Keeping in mind the precautions on static electricity and magnetized tools, you can turn off power to the computer and position it in a convenient, well lit area. If this involves moving it very far from its normal location, you will need to unplug its various terminal and printer cables. Be sure to label them so you can reinstall them easily when you're done.

1. Unlock the computer.

2. Remove the cover from the unit. Refer to your PC owner's manual for detailed instructions, if you need to.

3. Choose any available expansion slot and carefully insert the KTM-16AT into the guide channels. Push the board down gently until it's firmly seated on the planar board connector. (Make a note of which expansion slot you chose--you'll need that information later.)

4. Return the computer to its normal location, and reattach any cables you removed earlier.

5. Before you replace the cover, follow the instructions in the next section to configure the KTM-16AT Expansion Board as either Extended or Expanded memory.

Section 7 - The Configuration Setup Program

To configure the KTM-16AT Memory Expansion Board as either **extended** or **expanded** memory, you need to run the **ktcsetup** program on the Kingston Option Diskette. Take a moment to read through Appendix A, "Extended vs Expanded Memory", to determine how you want to configure the new memory on your system.

1. Set Switch 1 on SW1 on the KTM-16AT board to the **ON** position. This disables the memory while the system configuration is being set up.

2. Boot the computer.

3. Insert the Kingston Option Diskette into drive A:

4. Change the prompt to **A:**

5. Type KTCSETUP, and press **[enter]**.

6. A main menu will appear on the screen indicating the various choices you have to configure the new memory on the KTM-16AT board.

```
F1 ............................... Select amount of existing memory.
F2 ..............Select amount of memory on Kingston adapter board #1.
F3 ..............Select amount of memory on Kingston adapter board #2.
F4 ..............  Select amount of memory for use as EXPANDED memory.
F5 ..................................... Save configuration.
```

7. Press each Function key in sequence to see a vertical display of the memory configuration for that option. Use the up and down arrow keys to highlight the appropriate number, and press **[enter]** to save your selection.

   F2 and F3 allow you to select the amount of memory you want to use define as **extended** (linear) memory on the KTM-16AT board. (If you don't have a second KTM-16AT board, you can skip F3.)

   F4 allows you to select the amount of memory you want to define as **expanded** (paged) memory.

8. Press the ESC key to exit the **ktcsetup** program.

9. Reset Switch 1 on SW1 to the **OFF** position (Memory Enable).

10. Reboot the computer by turning it off, then on again. (This allows the configuration on the boards to reset.)

11. For your computer's operating system to recognize the new Kingston memory, you must run the **SETUP** configuration program for your particular computer. Read your system documentation and follow the standard procedure for running **SETUP**.

    If the **SETUP** program is on your hard drive, skip to the next step. If the **SETUP** program is on a diskette, insert the diskette into your floppy drive and continue with the next step.

12. Turn on power to the computer, and run the **SETUP** configuration program.

    Do not change any memory size parameters that **SETUP** displays. Even though you have just added several Megabytes of Kingston memory, answer **Y** (yes) when **SETUP** asks if the current memory sizes are correct. Your system will automatically recognize the new Kingston memory when the system reboots.

13. Replace the cover and tighten the screws that hold it in place. Make sure the cover is securely in place. Lock the cover and remove the key.

If you configured the KTM-16AT Memory Expansion Board with **extended** memory (option F2 or option F3), the installation procedure is complete, and you can begin using your PC to run programs and applications with the additional memory capacity of the Kingston KTM-16AT.

If you configured the KTM-16AT Memory Expansion Board with **expanded** memory (option F4), you also need to install the EMS Memory driver and modify the CONFIG.SYS file. Continue with the next section.

Section 8 - Modifying CONFIG.SYS

Caution: In some situations, the configuration of your computer system may require that you modify the CONFIG.SYS file directly. Please do not attempt to update this file unless you're already familiar with CONFIG.SYS.

Installing the Driver

Before attempting to install the device driver, make sure that the computer has expansion memory installed and that the additional memory is allocated as **expanded** memory. In addition, verify the following:

- Total amount of system memory (check when booting the system).
- That the system is not currently using any other EMS drivers (you must remove these device drivers before attempting to install the Kingston EMM driver).
- That a standard installation and setup procedure has been carried out before installing the Kingston EMM driver (Section 6 and 7),
- The Kingston EMM driver must be loaded as part of the boot sequence when the computer is turned on or restarted. Installation of the device driver is accomplished by placing a command in the computer's CONFIG.SYS file, which is the file the computer's operating system reads when the system is turned on or re-started. The CONFIG.SYS file must be in the root directory of the diskette or hard disk drive from which the computer boots.

The CONFIG.SYS file should contain this command line:

```
DEVICE = D:[path]\KTCEMM.SYS [options]
```

where D: and [path] represent the drive and path where the driver is located, and [options] represent those parameters described in "Command Line Options" later in this section. If you leave the options out of the command line, default values are used.

Expanded Memory Driver (EMS)

1. Boot your system.
2. Insert the Kingston Option Diskette into drive **A:**
3. Copy the KTCEMM.SYS file to your working disk.

Testing the Kingston EMM Driver

Reboot the computer to activate the Kingston EMM driver. When the driver is active, the following message appears:

```
Kingston Expanded Memory Manager Version 1.00

Kingston EMS Add-in Board Installed
1 Alternate Register Set(s) Found
256 EMS Pages Found (4096KB)
Total Memory Available for EMM Use = 4096KB
```

If an error message appears, refer to Appendix B, "Troubleshooting."

Using EMS 4.0

Environments such as Windows and DESQview detect the presence of the Kingston EMM driver when the computer is turned on. These environments use the driver and the computer's expanded memory automatically, so that other than noticing an improvement in performance, you will not be aware of how the memory is being used. You can check the amount of system memory by looking at the screen when you turn on the computer.

Command Line Options

Optional command line parameters are provided for customizing the Kingston EMM driver for different environments. Options must be separated by one or more spaces. Spaces are optional before and after the '-' and '=' symbols.

The options are as follows:

HANDLES = hhh – specifies the number of handles and names available. Handles are the values the memory manager assigns to identify a block of memory requested by an application program. Each application that uses extended or expanded memory requires at least one handle. Some need more than one, and the applications let you know if they run out of handles. The parameter **hhh** must be in the range 16 to 255. Note that each handle/name increases the amount of memory required and decreases the amount available to the application program. The default (64) should be adequate for most purposes.

EXCLUDE = xxxx [- cccc] –specifies an area of memory that should **not** be under the control of the driver. The parameters **xxxx** and **cccc** specify the range of memory to be excluded. The parameter **xxxx** should be a multiple of 16KB (that is, it should end in 00). For example, if a network card had memory at address CC00, then EXCLUDE = CC00-CFFF should be used. Note that the driver checks for the presence of ROM/RAM in the range A000-FFFF, so there is not usually any need to use EXCLUDE. F000-FFFF are always occupied by system ROM.

INCLUDE = xxxx [- cccc] – specifies the memory to be included under the control of the driver. Parameters are similar to the EXCLUDE option above. For example, if an EGA video adapter is installed in the computer, the monochrome graphics section of memory might not be used. So INCLUDE B000-B7FF could be used to allow the driver to make use of this part of the memory.

Note: If you are editing the command line yourself, the EXCLUDE and INCLUDE options may be used several times to exclude or include several areas of memory, though at least 64KB of memory above 640KB (A000) should remain. This facility is not available using the setup program. If you specify the same area of memory in an EXCLUDE and an INCLUDE statement, the command line order determines which statement will take effect.

FRAME = aaaa – specifies the page frame address (that is, the address of the 64KB segment through which the expanded memory is mapped). The parameter **aaaa** must be one of the following values: C000, C400, C800, D000, D400, D800, DC00, or E000. Specifying FRAME overrides the automatic choice of page frame, which is based on your hardware configuration. We recommend that you do not change it.

IOADDR = aaaa – overrides the default base I/O address at which the EMS hardware should be configured. The parameter **aaaa** must be one of the following values: 0208, 0218, 0258, 0268, 02A8, 02B8, or 02E8. The default is 0208 (hex). You should not change this unless you are sure that you have a conflict with another card.

SCAVENGE = xxxx [- cccc] – specifies an area of system shadow RAM in the range A000 - FFFF to be used for EMS memory. Normally, the shadow RAM is used to overlay system ROM regions, for the purpose of speeding up code execution from those areas. Not all of the shadow RAM is used, however. The areas that are not used may be *scavenged* for use as EMS memory with the SCAVENGE option. In most cases, SCAVENGE = A000 - FFFF is sufficient; however, some systems may experience problems. In cases where problems are encountered, specific areas such as video adapters may have to be avoided (SCAVENGE = C800 - FFFF).

Appendix A - Extended vs. Expanded Memory

There are two ways you can define the newly added memory in your computer system. You can define it as extended memory or expanded memory, or as a combination of the two. To understand the difference between the two ways you can configure memory, we need to take a step back in time.

Some History

When the PC was first designed, everyone thought that 640KB would be more memory than anyone could possibly use for their programs and data. The IBM PC originally contained an 8088 microprocessor which could address 1MB of memory, and the DOS operating system was designed to recognize only that much memory. Of the 1MB available, 640KB was devoted to running application programs. This portion of memory is also referred to as conventional or base memory.

The remaining 384KB of addressable memory, between 640KB and 1MB, is referred to as **reserved high memory**. This area of memory was devoted to video RAM, ROM BIOS (the Read Only Memory Basic Input/Output System), and other system and peripheral functions.

The next stage in the evolution of the PC was the PC AT which contained an 80286 microprocessor capable of addressing 15.5MB of memory. Current IBM PS/2 Model 50 and Model 60 computers also use this processor. However, DOS retained its 1MB addressing limitations so it would still be compatible with the older systems.

Extended (Linear) Memory

The original 640KB of memory was still available for use by DOS-compatible application programs, while the memory above 1MB (the extended memory) could be used by the processor for print spoolers and RAM disks.

Because the memory addresses continue sequentially from beginning to end, this memory is known as linear memory. Both conventional and extended memory are classified as linear memory.

Expanded (Paged) Memory

The development of the Expanded Memory System (EMS) was a software solution to the memory limitations of DOS. EMS uses a 64KB area of reserved high memory (the area between 640KB and 1MB that DOS is able to get to), and copies four 16KB "pages" of data back and forth as needed from the higher areas of memory that DOS cannot get to. The EMS acts as a messenger to locate and retrieve the segments of memory DOS requests and place them within its reach.

EMS software allows you to allocate up to 32MB of memory as expanded memory since it is not restricted by the 1MB limit of DOS or the 15.5MB limit of the processor.

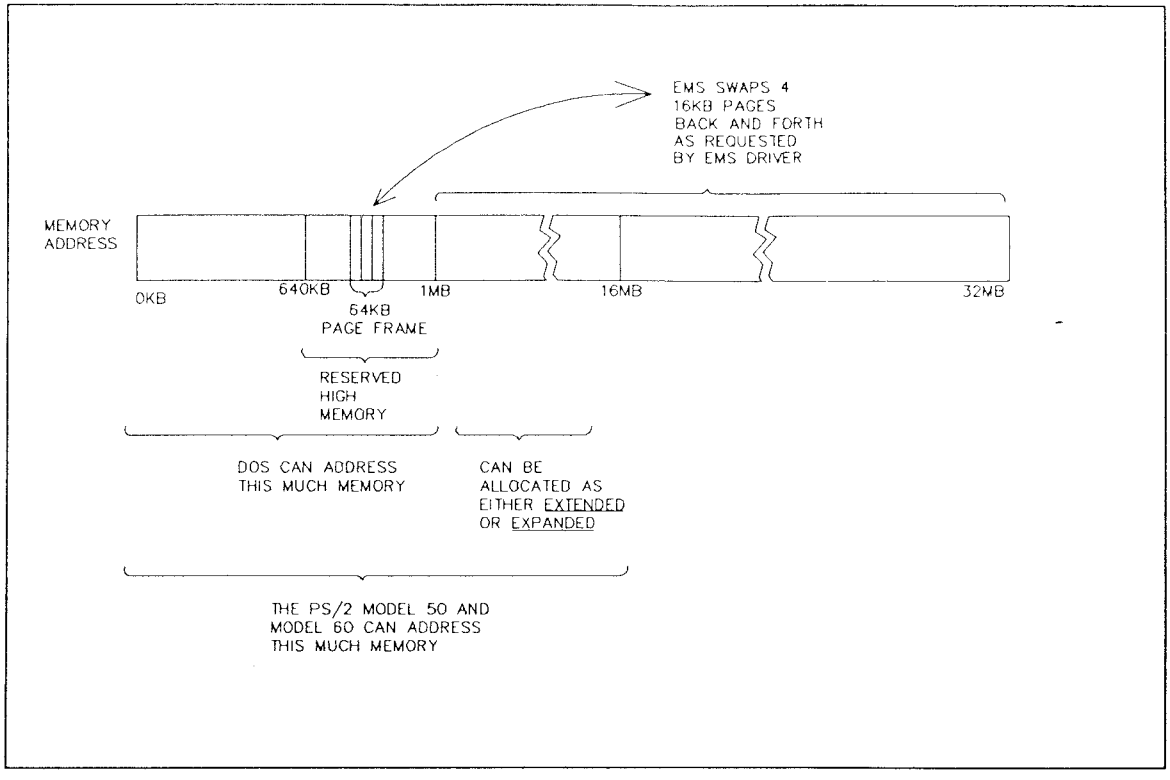


Figure 4: Expanded and Extended Memory Configuration

Appendix B - Troubleshooting

Once installed, Kingston Memory Expansion Boards are virtually trouble-free. You never need to give them a second thought. However, during the installation and configuration process, you may encounter situations that will test your diagnostic skills as well as your patience.

Error Messages

This section contains explanations of messages that may appear as a result of changes you made while using the INSTALL program, or as the result of changes you made directly to your CONFIG.SYS file. As a general rule, you should reboot the computer with the configuration diskette, fix the problem, and then reboot the computer from its standard diskette or hard drive.

In the event you see one of the hardware-related messages, you need to review the procedure you used to install the memory modules on the circuit board and the procedure you used to install the circuit board into the computer chassis.

An equal sign (=) was expected.

This message indicates you left out a required equal sign from one of the command options in the CONFIG.SYS file. Review the changes you made to CONFIG.SYS and correct the error.

Cannot detect mapping hardware.

This message indicates a possible hardware problem. Review the steps you took to install the SIMMs on the Kingston Memory Expansion Board (see Section 5), and the steps you took to install the memory board in the computer (see Section 6). Make sure the SIMMs are installed in the correct sequence on the memory board, and that all the SIMMs and memory boards are seated firmly in their sockets. Reboot from your standard DOS diskette or hard drive.

The command line is incomplete.

You modified the CONFIG.SYS file, but something is missing from one of the command options. Check each option you added or changed, and make sure each has the appropriate argument.

Decimal number overflow error.

Only the HANDLES option accepts a decimal argument; the other options require hexadecimal arguments. Check the CONFIG.SYS file to make sure you have specified arguments for each option in the appropriate notation.

FATAL ERROR - Memory manager not installed.

You have specified all or part of the new memory to be used as **expanded** (paged) memory, but you have not add the appropriate 'device' statement to your CONFIG.SYS file or you have not installed the Kingston EMM driver. Follow the instructions in Section 8, "Modifying CONFIG.SYS" to add the 'device' statement to CONFIG.SYS and to install the EMM driver.

Faulty or missing memory detected.

This message indicates a possible hardware problem. Review the steps you took to install the SIMMs on the Kingston Memory Expansion Board (see Section 5), and the steps you took to install the memory board in the computer (see Section 6). Make sure the SIMMs are installed in the correct sequence on the memory board, and that all the SIMMs and memory boards are seated firmly in their sockets. Reboot from your standard DOS diskette or hard drive.

Hardware does not support EMS version 4.

This message indicates a possible hardware problem. Review the steps you took to install the SIMMs on the Kingston Memory Expansion Board (see Section 5), and the steps you took to install the memory board in the computer (see Section 6). Make sure the SIMMs are installed in the correct sequence on the memory board, and that all the SIMMs and memory boards are seated firmly in their sockets. Reboot from your standard DOS diskette or hard drive.

Interrupt 67 vector already allocated.

You modified the CONFIG.SYS file to include the CHIPS EMM driver. Now, the CHIPS EMM driver is trying to use an interrupt vector already being used by some other driver. Check the CONFIG.SYS file to make sure no other EMS drivers are being used. If you find another driver in CONFIG.SYS, remove it, and reboot from your standard DOS diskette or hard drive.

Invalid hex number or number not divisible by 16.

The EXCLUDE, INCLUDE, and FRAME options in CONFIG.SYS require hexadecimal arguments. Reboot your computer with the configuration diskette, and check CONFIG.SYS to make sure these options, if present, have hexadecimal arguments. The allowable values are described in Section 8, "Modifying CONFIG.SYS." You may also see this message if the end address is less than the start address in an EXCLUDE or INCLUDE option.

Invalid page frame address.

The page frame address in the FRAME option in the CONFIG.SYS file must be one of the following values:

C000, C400, C800, CC00, D000, D400, D800, DC00, or E000

Check your CONFIG.SYS file and make sure it contains a valid FRAME address. (We recommend that you do not use the FRAME option. Delete the FRAME option, and let the CHIPS EMM driver automatically set the page frame address for you.)

I/O address specified is not one of the permitted values.

The I/O address in the IOADDR option of your CONFIG.SYS file must be one of the following values:

0208, 0218, 0258, 0268, 02A8, 02B8, or 02E8

If you omit the IOADDR option, the CHIPS EMM driver uses the default address value of 0208. You only need to specify this option if you are sure there is an address conflict with another circuit board.

No working memory can be found. EMM aborted.

This message indicates a possible hardware problem. Review the steps you took to install the SIMMs on the Kingston Memory Expansion Board (see Section 5), and the steps you took to install the memory board in the computer (see Section 6). Make sure the SIMMs are installed in the correct sequence on the memory board, and that all the SIMMs and memory boards are seated firmly in their sockets. Reboot from your standard DOS diskette or hard drive.

Number of handles is invalid or out of range.

The number of handles specified in your CONFIG.SYS file must be a decimal number in the range 16 to 255. (If you did not specify the HANDLES option, the default value is 64.) Reboot your computer with the configuration diskette, and check the CONFIG.SYS to make sure you specified a valid number of handles.

Unrecognized option/command in invocation line.

There is a typographical error in one of the options you added or changed in the CONFIG.SYS file. Check the option formats in Section 8, "Modifying CONFIG.SYS" to make sure your CONFIG.SYS file is correct.

WARNING: Problems encountered in setting default page frame address.

This message indicates a possible hardware problem. Review the steps you took to install the SIMMs on the Kingston Memory Expansion Board (see Section 5), and the steps you took to install the memory board in the computer (see Section 6). Make sure the SIMMs are installed in the correct sequence on the memory board, and that all the SIMMs and memory boards are seated firmly in their sockets. Reboot from your standard DOS diskette or hard drive.

Addendum

Note on EXPANDED MEMORY

If you intend to configure any or all of the KTM16AT memory as **EXPANDED MEMORY,** the EMS driver, KTCEMM.SYS might display the following error message:

No Working Memory Can Be Found

This is caused by slight variations in mother-board timing and is remedied by adding the "FRAME=XXXX" parameter to the EMS driver statement in CONFIG.SYS.

The "XXXX" specifies what is known as an "EMS Page Frame Address." The following values are acceptable EMS Page Frame Addresses:

C000	D000	E000	
C400	D400	E400	**Note: The "0"s are zeros, not the letter "O"**
C800	D800	E800	
CC00	DC00	EC00	

By trial and error, go through the above list of page frame addresses until one is found that works.

For example, try the value C000:

DEVICE=C:\KTCEMM.SYS **FRAME=C000**

If this does not work, try the next value, C400:

DEVICE=C:\KTCEMM.SYS **FRAME=C400**

If this does not work, try the next value, C800:

DEVICE=C:\KTCEMM.SYS **FRAME=C800**

and so on....